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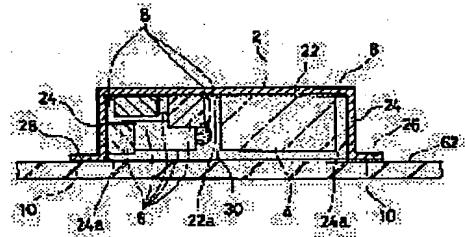
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(54) OSCILLATOR AND MANUFACTURE THEREOF

(57)Abstract:

PURPOSE: To provide the oscillator which can be miniaturized and easily manufactured and simplify the structure.

CONSTITUTION: A piezoelectric oscillator 4 and oscillation circuit component 6 are arranged at circuit wiring patterns 8 on an apex part inner surface 22a and a side part inner surface 24a of an electromagnetic shield cover 2 equipped with a recessed space 30 so as to be laminated in the recessed part space 30. Thus, the unused space of the recessed part space 30 can be decreased.



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CLAIMS

[Claim(s)]

[Claim 1] It has a piezoelectric transducer, oscillator-circuit components, and electromagnetic shielding covering. Electromagnetic shielding covering A crowning, The circuit circuit pattern prepared in the crevice space surrounded by the flank, and a crowning and a flank, and a top inside and a flank inside, The oscillator characterized by arranging so that it may have the external connection terminal which prepared near the pars basilaris ossis occipitalis and extended the circuit circuit pattern of a flank inside, a piezoelectric transducer and oscillator-circuit components may be connected to the circuit circuit pattern prepared in a top inside and a flank inside and a piezoelectric transducer and oscillator-circuit components may be piled up to crevice space.

[Claim 2] It has the piezoelectric transducer of a surface mount mold, the oscillator-circuit components of a surface mount mold, and electromagnetic shielding covering. Electromagnetic shielding covering A crowning, The circuit circuit pattern prepared in the crevice space surrounded by the flank, and a crowning and a flank, and a top inside and a flank inside, The oscillator characterized by arranging so that it may have the external connection terminal which prepared near the pars basilaris ossis occipitalis and extended the circuit circuit pattern of a flank inside, a piezoelectric transducer and oscillator-circuit components may be connected to the circuit circuit pattern prepared in a top inside and a flank inside and a piezoelectric transducer and oscillator-circuit components may be piled up to crevice space.

[Claim 3] The manufacture approach of the oscillator characterized by to form the crevice space which contains a piezoelectric transducer and oscillator-circuit components by forming an insulator on the metal plate of the shape of a predetermined extensive form, preparing on an insulator the circuit circuit pattern and the external connection terminal of a predetermined configuration which consist of a conductor, forming electromagnetic-shielding covering, mounting a piezoelectric transducer and oscillator-circuit components in the circuit circuit pattern of electromagnetic shielding covering after that, and performing bending of electromagnetic shielding covering after that.

[Claim 4] By forming an insulator on a metal plate, preparing on an insulator the circuit circuit pattern and external connection terminal of a predetermined configuration which consist of a conductor, and the metal plate which has a circuit circuit pattern extracting after that, and processing it By forming electromagnetic shielding covering which has the shape of a predetermined extensive form, mounting a piezoelectric transducer and oscillator-circuit components in the circuit circuit pattern of electromagnetic shielding covering after that, and performing bending of electromagnetic shielding covering after that The manufacture approach of the oscillator characterized by forming the crevice space which contains a piezoelectric transducer and oscillator-circuit components.

[Claim 5] Form an insulator on a metal plate and the circuit circuit pattern and external connection terminal of a predetermined configuration which consist of a conductor are prepared on an insulator. Then, by mounting a piezoelectric transducer and oscillator-circuit components in a circuit circuit pattern, and processing it by the metal plate which has the circuit circuit pattern which mounted a piezoelectric transducer and oscillator-circuit components extracting after that The manufacture approach of the oscillator characterized by forming the crevice space which contains a piezoelectric transducer and oscillator-circuit components by forming electromagnetic shielding covering which has

the shape of a predetermined extensive form, and performing bending of electromagnetic shielding covering after that.

[Claim 6] On the film of an insulator, prepare the circuit circuit pattern and external connection terminal of a predetermined configuration which consist of a conductor, and a flexible substrate is formed. Then, make a flexible substrate rival in the metal plate of the shape of a predetermined extensive form, and electromagnetic shielding covering is formed in it. Then, the manufacture approach of the oscillator characterized by forming the crevice space which contains a piezoelectric transducer and oscillator-circuit components by mounting a piezoelectric transducer and oscillator-circuit components in the circuit circuit pattern of electromagnetic shielding covering, and performing bending of electromagnetic shielding covering after that.

[Claim 7] On the film of an insulator, prepare the circuit circuit pattern and external connection terminal of a predetermined configuration which consist of a conductor, and a flexible substrate is formed. A flexible substrate lamination and after that to a metal plate then, by [of the metal plate and flexible substrate which were made to rival] processing it by extracting By forming electromagnetic shielding covering which has the shape of a predetermined extensive form, mounting a piezoelectric transducer and oscillator-circuit components in the circuit circuit pattern of a flexible substrate after that; and performing bending of electromagnetic shielding covering after that The manufacture approach of the oscillator characterized by forming the crevice space which contains a piezoelectric transducer and oscillator-circuit components.

[Claim 8] On the film of an insulator, prepare the circuit circuit pattern and external connection terminal of a predetermined configuration which consist of a conductor, and a flexible substrate is formed. Then, the flexible substrate which mounted the flexible substrate in the metal plate, mounted a piezoelectric transducer and oscillator-circuit components in the circuit circuit pattern of a flexible substrate lamination and after that, and mounted a piezoelectric transducer and oscillator-circuit components after that, By forming electromagnetic shielding covering which has the shape of a predetermined extensive form by [with the metal plate made to rival] processing it by extracting, and performing bending of electromagnetic shielding covering after that The manufacture approach of the oscillator characterized by forming electromagnetic shielding covering which has the crevice space which contains a piezoelectric transducer and oscillator-circuit components.

[Claim 9] On the film of an insulator, prepare the circuit circuit pattern and external connection terminal of a predetermined configuration which consist of a conductor, and a flexible substrate is formed. Then, a piezoelectric transducer and oscillator-circuit components are mounted in the circuit circuit pattern of a flexible substrate. Then, by making a flexible substrate rival in the metal plate of the shape of a predetermined extensive form, forming electromagnetic shielding covering in it, and performing bending of electromagnetic shielding covering to it after that The manufacture approach of the oscillator characterized by forming electromagnetic shielding covering which has the crevice space which contains a piezoelectric transducer and oscillator-circuit components.

[Claim 10] On the film of an insulator, prepare the circuit circuit pattern and external connection terminal of a predetermined configuration which consist of a conductor, and a flexible substrate is formed. Then, the flexible substrate which mounted a piezoelectric transducer and oscillator-circuit components in the circuit circuit pattern of a flexible substrate, and mounted a piezoelectric transducer and oscillator-circuit components in the metal plate for the flexible substrate lamination and after that after that, By forming electromagnetic shielding covering which has the shape of a predetermined extensive form by [with the metal plate made to rival] processing it by extracting, and performing bending of electromagnetic shielding covering after that The manufacture approach of the oscillator characterized by forming electromagnetic shielding covering which has the crevice space which contains a piezoelectric transducer and oscillator-circuit components.

[Claim 11] The manufacture approach of the oscillator characterized by forming electromagnetic shielding covering which has the crevice space which contains a piezoelectric transducer and oscillator-

circuit components by mounting at least one of a piezoelectric transducer and the oscillator-circuit components in the circuit circuit pattern of electromagnetic shielding covering, and performing bending of magnetic-shielding covering after that, and mounting at least one of a piezoelectric transducer and the oscillator-circuit components in a circuit circuit pattern after that.

[Claim 12] The flank of electromagnetic shielding covering which has an external connection terminal is claim 1 characterized by having a surface part corresponding to the exterior bent and prepared so that it may become almost parallel to a crowning, and preparing an external connection terminal in the surface part corresponding to the exterior, or an oscillator according to claim 2.

[Claim 13] A circuit circuit pattern and an external connection terminal are claim 1 characterized by exposing an external connection terminal from the roll off which put both sides with the film of an insulator partially, constituted the flexible substrate, and cut and lacked the side face of electromagnetic shielding covering, or an oscillator according to claim 2.

[Claim 14] The flank of electromagnetic shielding covering which has an external connection terminal It has a surface part corresponding to the exterior bent and prepared so that it may become almost parallel to a crowning. Prepare an external connection terminal in the surface part corresponding to the exterior, and further, a circuit circuit pattern and an external connection terminal put both sides with the film of an insulator partially, and constitute a flexible substrate. Claim 1 characterized by exposing an external connection terminal from the roll off which cut and lacked the side face of electromagnetic shielding covering, or an oscillator according to claim 2.

[Claim 15] An external connection terminal is claim 13 characterized by preparing so that it may be made to expose to the roll off of electromagnetic shielding covering outside, and preparing the solder resist section between an external connection terminal and the metal plate of electromagnetic shielding covering, or an oscillator according to claim 14.

[Claim 16] The surface part corresponding to the exterior is an oscillator according to claim 12 characterized by bending outside and exposing some external connection terminals [at least] on the outside of an oscillator.

[Claim 17] The crevice space of electromagnetic shielding covering is claim 1 characterized by having circuit encapsulant, claim 2, claim 12, claim 13, claim 14, claim 15, or an oscillator according to claim 16.

[Claim 18] The flank of electromagnetic-shielding covering equipped with an external connection terminal is the manufacture approach of claim 3 characterized by to form the surface part corresponding to the exterior which bends so that it may become almost parallel to a crowning, and has an external connection terminal, and to make connection with the external connection terminal of a surface part and the external circuit corresponding to the exterior using anisotropy electroconductive glue, claim 4, claim 5, claim 6, claim 7, claim 8, claim 9, claim 10, or an oscillator according to claim 11.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the structure of an oscillator of storing a piezoelectric transducer and oscillator-circuit components in one case, and the manufacture approach for forming this structure.

[0002]

[Description of the Prior Art] In recent years, in small communication equipment, such as a cellular phone with which spread is progressing, it has the oscillator as a source of a frequency oscillation for obtaining the stable frequency.

[0003] That configuration of this small communication equipment is small, moreover, a lightweight thing and high dependability are required and the formation of small lightweight and high-reliability-ization are similarly demanded from the oscillator which is a component part.

[0004] Moreover, in order to raise productivity, the efforts for for automating like an erector as much as possible are made, and the thing of a surface mount mold is used abundantly also for the component part of an oscillator.

[0005] A configuration can also be made small and the components of this kind of surface mount mold can mount it in the predetermined location of the circuit board automatically using a parts feeder, a robot, etc.

[0006] and a reliable oscillator — the electromagnetism from the outside — while preventing a noise.— the exterior — electromagnetism — it had electromagnetic shielding covering for preventing taking out a noise, and piezoelectric transducers and oscillator circuits, such as a quartz resonator, are protected.

[0007] As structure of a small oscillator, notching is prepared in the circuit board which is indicated by JP,5-121940,A, for example, the notching section is utilized as a receipt field which contains some quartz resonators, and the structure of an oscillator of performing small lightweight-ization etc. is proposed.

[0008] Moreover, the support for carrying a quartz resonator which is indicated by JP,3-128325,U and JP,4-34569,U, for example is made into the circuit board and integral construction, and the structure of a substrate of carrying the quartz resonator miniaturized by making it easy to mount etc. is proposed.

[0009] Also when it constitutes an oscillator from a substrate carrying these quartz resonators, in order to secure dependability, it is necessary to have electromagnetic shielding covering. A drawing is used for below and the oscillator in the conventional technique is explained to it.

[0010] Drawing 9 , drawing 11 , and drawing 12 are the drawings in which the structure of the conventional oscillator is shown, and are a perspective view in which some electromagnetic shielding coverings of an oscillator are cut, and each lacks and shows it. And drawing 10 is the sectional view showing the cross section in D-D line of drawing 9 . With reference to drawing 9 , drawing 10 , drawing 11 , and drawing 12 by turns, it explains below.

[0011] In this kind of oscillator, a pewter and electroconductive glue are used for the circuit circuit pattern 8 of substrate 88 front face, and the oscillator-circuit components 6 which consist of the piezoelectric transducer 4 which enclosed piezo-electric oscillating pieces, such as a Xtal oscillating piece, with the case, a semiconductor integrated circuit which constitutes an oscillator circuit, a capacitor, etc. are mounted in it.

[0012] And it prepares so that the electromagnetic shielding covering 82 which consists of conductors, such as a metallic thin plate which has the function of electromagnetic shielding, may be further put on the substrate 88 which mounted these.

[0013] A substrate 88 consists of insulating materials, such as a ceramic and resin, and has a rectangular plate configuration mostly.

[0014] Here, the circuit circuit pattern 8 consists of metal membranes, such as copper and silver metallurgy, and is formed in a configuration predetermined by etching processing, print processes, etc. And if needed, this circuit circuit pattern 8 is formed in both sides of the front flesh side of a substrate

88, or is prepared in the interior of a substrate 88 at a multilayer.

[0015] The circuit circuit pattern 8 exposed to the front face of a substrate 88 is partially coated with an insulating material further again, in order to prevent a pewter and electroconductive glue flowing a front face into the exterior of the circuit circuit pattern 8 if needed at the time of the poor insulation by dust etc., and component mounting.

[0016] The external connection terminal 92 which performs electrical installation of an oscillator and an external circuit consists of metal lead wire of a predetermined number, and carries out connection immobilization near the edge of the circuit circuit pattern 8 near the pars basilaris ossis occipitalis of an oscillator corresponding to the external connection side 62 of an external circuit.

[0017] Generally metallic thin plates, such as iron and brass, extract the electromagnetic shielding covering 82, and it performs processing and spinning, and it forms them so that it may have the crevice space 30 in the interior.

[0018] And the opening edge of the electromagnetic shielding covering 82 is fixed to the periphery of a substrate 88 so that a piezoelectric transducer 4 and the oscillator-circuit components 6 may be stored in the crevice space 30. The electromagnetic shielding covering 82 is connected to the circuit circuit pattern 8 with predetermined potential with this.

[0019] Generally the mounting tooth space when carrying an oscillator in electronic equipment serves as a rectangular parallelepiped and a cube. Moreover, the appearance configuration of an oscillator is the appearance configuration of the electromagnetic shielding covering 82, if the external connection terminal 92 is removed.

[0020] The electromagnetic shielding covering 82 usually has the crowning 84 which is a rectangle mostly and is a flat surface like the configuration of a substrate 88, and has mostly the flank 86 which has the same height in the perimeter of the periphery section of a crowning 84 covering a right angle from the periphery section of the crowning 84. And it has the crevice space 30 surrounded by the crowning 84 and the flank 86.

[0021] Mounting components, such as height, the piezoelectric transducer 4 with the various configuration, and the oscillator-circuit components 6, are carried in the substrate 88 of a flat-surface configuration. Therefore, the crevice space 30 is prepared for the electromagnetic shielding covering 82 which contains these mounting components so that the highest mounting components of height may be settled.

[0022] Therefore, when mounting components with a various height dimension are carried in the substrate 88 of a flat-surface configuration and a crowning 84 covers with the electromagnetic shielding covering 82 of a flat-surface configuration, intact space remains in the upper part of the small mounting components of a height dimension. For this reason, high density assembly cannot be performed to the crevice space 30.

[0023] The height dimension of the components carried in current and an oscillator has a piezoelectric transducer 4 in the highest inclination, and it is 1.2–2.5mm also in the piezoelectric transducer 4 of a small surface mount mold. On the other hand, the small oscillator-circuit components 6, such as a capacitor, are 0.5–1.5mm, and its height dimension is various.

[0024] Drawing 9 is the perspective view showing the structure which constituted a piezoelectric transducer 4 and the oscillator-circuit components 6 from components of a surface mount mold, and carried out the surface mount of these to the substrate 88.

[0025] Since a surface mount can do structure shown in this drawing 9 in automatic assembling, the productivity of a piezoelectric transducer 4 and the oscillator-circuit components 6 is good. However, a piezoelectric transducer 4 and the oscillator-circuit components 6 are mounted superficially. For this reason, a component-side product becomes large and the area of a substrate 88 becomes large inevitably. The configuration of the whole oscillator will also become large by it.

[0026] After drawing 11 considers a piezoelectric transducer 4 as a type with lead wire, and constitutes the oscillator-circuit components 6 from components of a surface mount mold and carries out the

surface mount of the oscillator-circuit components 6 to a substrate 88, it is the perspective view showing the conventional example which arranged the piezoelectric transducer 4 in three dimensions to the up space of the oscillator-circuit components 6.

[0027] Although the component-side product of the structure shown in this drawing 11 is smaller than the oscillator shown in drawing 9, the space beside a piezoelectric transducer 4 is intact, and the electromagnetic shielding covering 82 has intact space to the crevice space 30.

[0028] For this reason, high density assembly will not be made but the configuration of the whole oscillator will also become large by it.

[0029] Moreover, since the piezoelectric transducer 4 equipped with lead wire in the oscillator shown in drawing 11 is mounted, the surface mount of automatic assembling is not made, but handling is troublesome, and productivity is not good.

[0030] Furthermore, drawing 12 considers a piezoelectric transducer 4 as a type with lead wire, constitutes the oscillator-circuit components 6 from components of a surface mount mold, and after [a substrate 88] forming the notching section 90 in a field in part and carrying out the surface mount of the oscillator-circuit components 6 to a substrate 88, it is the perspective view showing the conventional example indicated by JP,5-121940,A of having contained some piezoelectric transducers 4 in the notching section 90 of a substrate 88, and having mounted the piezoelectric transducer 4 in it.

[0031] Although mounting height becomes small since the structure shown in this drawing 12 has formed the notching section 90, a piezoelectric transducer 4 and the oscillator-circuit components 6 as well as the oscillator shown in drawing 9 are mounted superficially. For this reason, a component-side product will become large and the configuration of the whole oscillator will also become large by it.

[0032] Furthermore, since the piezoelectric transducer 4 with lead wire as well as the oscillator shown in drawing 11 is mounted, the surface mount of automatic assembling is not made with the structure shown in drawing 12, but handling is troublesome, and productivity is not good.

[0033]

[Problem(s) to be Solved by the Invention] As explained above, in order that an oscillator may fill the request of a miniaturization, with the conventional technique, from the first, the miniaturization of each components of a piezoelectric transducer 4 or the oscillator-circuit components 6 forms the notching section 90 in a substrate 88, and is devising containing a part of volume of a piezoelectric transducer 4 etc.

[0034] Moreover, in order to attain especially automation of assembly, the motion which uses a piezoelectric transducer 4 and the oscillator-circuit components 6 as the components of a surface mount mold, and carries out a surface mount to the front face of a substrate 88 has been activating in recent years.

[0035] However, in an oscillator with the structure where automation of the conventional assembly can be attained, the surface mount of the mounting components, such as a height dimension, the piezoelectric transducer 4 with the various configuration, and the oscillator-circuit components 6, is superficially carried out to the substrate 88 of a flat-surface configuration.

[0036] For this reason, it has intact space to the crevice space 30 inside the electromagnetic shielding covering 82, and high density assembly will not be able to be performed, but the configuration of an oscillator will become large by it.

[0037] Furthermore, the need of mounting the components decided to be the substrates 88 of a smaller configuration in high density is increasing as the miniaturization of an oscillator progresses.

[0038] Therefore, the demand of location precision with the circuit circuit pattern 8 to the appearance of a substrate 88, each configuration precision, such as the piezoelectric transducer 4 and the oscillator-circuit components 6 which are mounted in a substrate 88, the external connection terminal 92, and the electromagnetic shielding covering 82, mounting precision, such as the piezoelectric transducer 4 and the oscillator-circuit components 6 to the circuit circuit pattern 8; and the external connection terminal 92, the pewter that is a jointing material for corrugated fibreboard at the time of

component mounting, the amount of flashes of electroconductive glue, etc. is becoming severe.

[0039] Therefore, when fixing the opening edge of the electromagnetic shielding covering 82 to the periphery of a substrate 88 according to dispersion, fault, etc. of each precision, the electromagnetic shielding covering 82 contacts a part with inconvenient jointing materials for corrugated fibreboard, such as the external connection terminal 92, the circuit circuit pattern 8, the oscillator-circuit components 6, a piezoelectric transducer 4, and an overflowing pewter. Therefore, it short-circuits electrically and there is a problem of causing poor assembly.

[0040] The technical-problem point describing above is solved, and with content volume, the purpose of this invention has a small area of base, is small, and is offering the manufacture approach for structure forming the structure of an easy oscillator, and this structure moreover.

[0041]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the structure and the manufacture approach of the following publication are used for the structure and its manufacture approach of an oscillator of this invention.

[0042] The oscillator of this invention is equipped with a piezoelectric transducer, oscillator-circuit components, and electromagnetic shielding covering. Electromagnetic shielding covering A crowning, The circuit circuit pattern prepared in the crevice space surrounded by the flank, and a crowning and a flank, and a top inside and a flank inside, It has the external connection terminal which prepared near the pars basilaris ossis occipitalis and extended the circuit circuit pattern of a flank inside, a piezoelectric transducer and oscillator-circuit components are connected to the circuit circuit pattern prepared in a top inside and a flank inside, and it is characterized by arranging so that a piezoelectric transducer and oscillator-circuit components may be piled up to crevice space.

[0043] The manufacture approach of the oscillator of this invention forms an insulator on the metal plate of the shape of a predetermined extensive form. On an insulator, prepare the circuit circuit pattern and external connection terminal of a predetermined configuration which consist of a conductor, and electromagnetic shielding covering is formed. Then, it is characterized by forming the crevice space which contains a piezoelectric transducer and oscillator-circuit components by mounting a piezoelectric transducer and oscillator-circuit components in the circuit circuit pattern of electromagnetic shielding covering, and performing bending of electromagnetic shielding covering after that.

[0044]

[Function] The oscillator of this invention prepares a circuit circuit pattern also in the top inside and flank inside of electromagnetic shielding covering which have crevice space. And it arranges so that a piezoelectric transducer and oscillator-circuit components may be piled up to this circuit circuit pattern in crevice space.

[0045] By this, conventionally, the space which was intact as for crevice space can be decreased, it is easy structure, an area of base becomes small with content volume, and the miniaturization of an oscillator can be attained.

[0046] Furthermore, when electromagnetic shielding covering equipped with the circuit circuit pattern and external connection terminal of a predetermined configuration has the shape of a plate-like extensive form, a piezoelectric transducer and oscillator-circuit components are mounted in the circuit circuit pattern of the top inside in electromagnetic shielding, and a flank inside, and bending of electromagnetic shielding covering is performed after that.

[0047] By forming the crevice space which contains this piezoelectric transducer and oscillator-circuit components, a piezoelectric transducer and oscillator-circuit components can be arranged so that it may be piled up to high density in crevice space, and the miniaturization of an oscillator and improvement in productivity can be attained.

[0048] Furthermore, after mounting oscillator-circuit components and a piezoelectric transducer in a circuit circuit pattern like before, it is not necessary to put electromagnetic shielding covering.

[0049] For this reason, it does not occur that electromagnetic shielding covering, and oscillator-circuit

components and a piezoelectric transducer short-circuit electrically, but the oscillator which has a miniaturization and the outstanding productivity is obtained.

[0050] Furthermore, the external connection terminal linked to an external circuit is prepared in the surface part corresponding to the exterior, or connection between an external circuit and an external connection terminal is made using anisotropy electroconductive glue.

[0051] being small by this — in addition, connection immobilization of many external connection terminals can be easily carried out certainly with high connection resilience in a small occupancy area in an external circuit.

[0052] Furthermore, circuit encapsulant is poured into the crevice space of electromagnetic shielding covering, and the structure which closes a piezoelectric transducer and oscillator-circuit components is adopted. In addition to a small thing, by this, the oscillator excellent in dependability, such as shock resistance and moisture resistance, can be offered.

[0053]

[Example] Hereafter, the oscillator in the example of this invention is explained using a drawing. Drawing 1 is a perspective view which shows the oscillator in the 1st example of this invention, cuts and lacks some electromagnetic shielding coverings of an oscillator, and is shown from a rear face. Drawing 2 is the sectional view in which showing the oscillator in the 1st example of this invention, and showing the cross section in the A-A line of drawing 1. Drawing 3 is the top view showing signs that the oscillator in the 1st example of this invention was developed. With reference to drawing 1, drawing 2, and drawing 3 by turns, it explains below.

[0054] The configuration of the oscillator of this invention is equipped with a piezoelectric transducer 4, the oscillator-circuit components 6, the electromagnetic shielding covering 2, the circuit circuit pattern 8, and the external connection terminal 10.

[0055] A piezoelectric transducer 4 carries out airtight enclosure of a quartz resonator, electrostrictive ceramics, the piezo-electric plastics, etc. at the case which consists of ceramics, glass, etc. of a surface mount mold.

[0056] The circuit circuit pattern 8 has the role which wires the oscillator-circuit components 6 which consist of a semiconductor integrated circuit which constitutes an oscillator circuit, a capacitor, etc., and a piezoelectric transducer 4.

[0057] the electromagnetic shielding covering 2 — the crevice space 30 of the interior — a piezoelectric transducer 4 and the oscillator-circuit components 6 — containing — the electromagnetism from the outside — a piezoelectric transducer 4 and the oscillator-circuit components 6 are protected from a noise — both — the exterior — electromagnetism — it has the function of the electromagnetic shielding which prevents taking out a noise.

[0058] The I/O signal to the circuit of the exterior from an oscillator outputs and inputs from the external connection terminal 10. Near the pars basilaris ossis occipitalis close to an external circuit, this external connection terminal 10 extends and constitutes the circuit circuit pattern 8.

[0059] Moreover, the substrate which has the plate configuration of a rectangle like the conventional technique shown in drawing 12 from drawing 9 in the oscillator of this invention is unnecessary.

[0060] With reference to drawing 1 and drawing 2, the electromagnetic shielding covering 2 has the crowning 22 which is a rectangle mostly and is a flat-surface configuration. Furthermore, it has mostly the flank 24 which has the same height in the perimeter of the periphery section of a crowning 22 mostly covering a right angle from the periphery section of the crowning 22. And it has the crevice space 30 surrounded by this crowning 22 and flank 24.

[0061] And the circuit circuit pattern 8 is formed in flank inside 24a of the electromagnetic shielding covering 2, and top inside 22a. And connection immobilization of the oscillator-circuit components 6 which constitute the piezoelectric transducer 4 of a surface mount mold and the oscillator circuit of two or more surface mount molds in the circuit circuit pattern 8 of this top inside 22a is carried out using a pewter or electroconductive glue.

[0062] Furthermore, connection immobilization is carried out using the jointing material for corrugated fibreboard which becomes the circuit circuit pattern 8 of flank inside 24a from a pewter or electroconductive glue about the oscillator-circuit components 6 of some surface mount molds.

[0063] The piezoelectric transducer 4 mounted in top inside 22a, and the oscillator-circuit components 6 and the oscillator-circuit components 6 mounted in flank inside 24a have the appearance configuration where a height dimension and its configuration are various. However, these piezoelectric transducer 4 and oscillator-circuit components 6 are stacked so that the clearance between the crevice space 30 may be filled, and they are arranged on high density and a solid target in weight.

[0064] Here, the electromagnetic shielding covering 2 is connected to the circuit circuit pattern 8 with ground potential or fixed potential in order to obtain the stable shielding effect.

[0065] The structure of the oscillator of this invention arranges mounting components, such as a piezoelectric transducer 4 and the oscillator-circuit components 6, not only to top inside 22a but to flank inside 24a. Consequently, since it arranges so that an area of base can be made small and the crevice space 30 may become high density about mounting components, the miniaturization of an oscillator can be attained.

[0066] The external connection terminal 10 constituted from conductors, such as a metal, is formed in the outside field of the crevice space 30, and is connected with an external circuit with jointing materials for corrugated fibreboard, such as a pewter and electroconductive glue.

[0067] By this, an external circuit and the oscillator circuit of an oscillator are connected electrically. Mechanical immobilization of an oscillator may also be performed.

[0068] The external connection terminal 10 extends and consists of circuit circuit patterns 8 of flank inside 24a of the electromagnetic shielding covering 2. Therefore, the external connection terminal 10 is constituted using some circuit circuit patterns 8, without using another components, such as lead wire, near the edge of the circuit circuit pattern 8.

[0069] Moreover, as shown in drawing 2, the external connection terminal 10 is formed near the pars basilaris ossis occipitalis of an oscillator. This is for making crevice space 30 of the oscillator of this invention into the space closed by connection with the external connection side 62 on the front face of a substrate of an external circuit.

[0070] The structure and its formation approach of the external connection terminal 10 are adapted for any example of the oscillator of this invention, and at the time of formation of the circuit circuit pattern 8, the external connection terminal 10 is the same ingredient as the circuit circuit pattern 8; and, moreover, they form it in coincidence.

[0071] However, when the circuit circuit pattern 8 and the external connection terminal 10 form with copper, silver, etc., since a front face tends to oxidize, connection by the pewter of the external connection terminal 10 and an external circuit cannot carry out skillful ** of this copper, silver, etc.

[0072] Moreover, when the circuit circuit pattern 8 and the external connection terminal 10 form by silver palladium, this silver palladium has the property consumed by the pewter. For this reason, skillful ** of the connection by the pewter of the external connection terminal 10 and an external circuit cannot be carried out.

[0073] In order to solve such a problem, the metal membrane which consists of still more nearly another ingredient may be formed in the front face of the external connection terminal 10 formed with the same ingredient as the circuit circuit pattern 8, or the ingredient of the external connection terminal 10 may consist of ingredients different from the circuit circuit pattern 8.

[0074] For example, what is necessary is to carry out film formation of the metals, such as pewter metallurgy for antioxidantizing, on the front face of the external connection terminal 10, or just to carry out film formation of the nickel for preventing a pewter foods crack.

[0075] Although the structure of the external connection terminal 10 showed the example constituted using some circuit circuit patterns 8 not using another components, such as lead wire, it may connect and constitute the lead wire which consists of another components depending on an application from

the above explanation near the edge of the circuit circuit pattern 8.

[0076] It bent and the surface part 26 corresponding to the exterior formed the flank 24 of the electromagnetic shielding covering 2 which has the external connection terminal 10 so that it might become almost parallel to a crowning 22, and it provides it so that the external connection terminal 10 may touch almost in parallel to the external connection side 62 of an external circuit.

[0077] In addition, although it illustrated and drawing 1 and drawing 2 explained that the surface part 26 corresponding to the exterior was formed, this surface part 26 corresponding to the exterior may not exist.

[0078] The manufacture approach of the oscillator in the 1st example of this invention is explained referring to drawing 1, drawing 2, and drawing 3.

[0079] First, an insulator (not shown) is formed on the metal plate (not shown) which consists of iron which has the shape of a predetermined extensive form, brass, etc.

[0080] Resin without conductivity, such as a polyimide system and an epoxy system, the ceramics, glass, etc. are used for this insulator. And when an insulator is resin, an insulator is made to fix on the surface of a metal plate by forming liquefied resin on the surface of a metal plate by predetermined thickness, and adding heat and ultraviolet rays.

[0081] And on the insulator, the circuit circuit pattern 8 and the external connection terminal 10 of a predetermined configuration which consist of a conductor are prepared, and the electromagnetic shielding covering 2 is formed.

[0082] The circuit circuit pattern 8 carries out coat formation of the metals, such as copper, aluminum, and silver metallurgy, with the sputtering method, a vacuum deposition method, etc., or forms them by the approach of printing conductive paste.

[0083] The configuration of the circuit circuit pattern 8 connects a piezoelectric transducer 4 and the oscillator-circuit components 6 to a position, and as it forms the external connection terminal 10 further, it forms them in a predetermined configuration.

[0084] Furthermore, in order to prevent jointing materials for corrugated fibreboard, such as a pewter and electroconductive glue, flowing out to the exterior of the circuit circuit pattern 8 if needed at the time of the poor insulation by dust etc., and component mounting to the circuit circuit pattern 8, the insulating material (not shown) which consists of resin without conductivity, ceramics; etc. may be coated partially in addition to a connection field.

[0085] What has the elasticity which uses the good thing of adhesion mutually and can be equal to bending is used for the insulator made to fix on the surface of a metal plate, the circuit circuit patterns 8, such as a metal membrane, and the insulating material for coating the circuit circuit pattern 8.

[0086] Next, the surface mount of the piezoelectric transducer 4 of a surface mount mold and the oscillator-circuit components 6 of a surface mount mold is carried out to the circuit circuit pattern 8 of the electromagnetic shielding covering 2.

[0087] A surface mount process prepares jointing materials for corrugated fibreboard (not shown), such as a pewter paste and electroconductive glue, in the field which connects mounting components, such as a piezoelectric transducer 4, the oscillator-circuit components 6, etc. of the circuit circuit pattern 8, first.

[0088] Mounting components are arranged using an automatic surface mount machine so that polar zone, such as a predetermined piezoelectric transducer 4, the predetermined oscillator-circuit components 6, etc., may next come to the location in which the jointing material for corrugated fibreboard was prepared.

[0089] And a reflow process, an electroconductive glue hardening process, etc. which are heat-treatment are performed, and the polar zone of the mounting components of the circuit circuit pattern 8, and the piezoelectric transducer 4 and the oscillator-circuit components 6 is connected with a jointing material for corrugated fibreboard.

[0090] The electromagnetic shielding covering 2 can be formed in a configuration which mounted a piezoelectric transducer 4 and the oscillator-circuit components 6 in the electromagnetic shielding

covering 2 of the developed configuration as shown in drawing 3 at these processes.

[0091] And the electromagnetic shielding covering 2 which has the shape of a predetermined extensive form as shown in drawing 3 is bent so that a piezoelectric transducer 4 and the oscillator-circuit components 6 may moreover become inside, as a crowning 22 and a flank 24 become almost perpendicular, and the configuration which has the crevice space 30 is formed.

[0092] Before making a piezoelectric transducer 4 and the oscillator-circuit components 6 into the configuration which bends the electromagnetic shielding covering 2 and has the crevice space 30, they are connected to the circuit circuit pattern 8.

[0093] And when it is made the configuration which bends the electromagnetic shielding covering 2 and has the crevice space 30, a piezoelectric transducer 4 and the oscillator-circuit components 6 are connected to the circuit circuit pattern 8 by the arrangement beforehand taken into consideration so that a piezoelectric transducer 4 and the oscillator-circuit components 6 may be piled up to high density in the crevice space 30 and it may arrange.

[0094] The above explanation showed the example which uses a piezoelectric transducer 4 and the oscillator-circuit components 6 as a surface mount mold. However, as long as it can arrange so that it may be piled up to high density in the crevice space 30 when it is made the configuration which bends the electromagnetic shielding covering 2 and has the crevice space 30, a piezoelectric transducer 4 and the oscillator-circuit components 6 may not be components of a surface mount mold.

[0095] One or more of a piezoelectric transducer 4 and the oscillator-circuit components 6 may be [the remainder] the components of a surface mount mold with components other than a surface mount mold further again. That is, you may mount so that surface mount die parts and non-surface mount die parts may be intermingled.

[0096] Although the example which forms the electromagnetic shielding covering 2 which furthermore extracts a metal plate and has the shape of a predetermined extensive form by processing was shown, a metal plate may be formed by other processing approaches, such as other shearing works, cutting processing, and etching processing.

[0097] Since it forms with a metallic thin plate with a thickness of 0.1mm – 0.2mm, it is bending-easy and easy to process this electromagnetic shielding covering 2.

[0098] By this manufacture approach, the substrate for mounting which was the need conventionally can be excluded, a piezoelectric transducer 4 and the oscillator-circuit components 6 can be mounted with automatic-assembling mounting equipment, and, moreover, it can mount in high density.

[0099] There is no process which puts the electromagnetic shielding covering 2 on mounting components mounted in the substrate, such as a piezoelectric transducer 4 and the oscillator-circuit components 6, further again. For this reason, the poor assembly the electromagnetic shielding covering 2 and mounting components short-circuit electrically is not caused, but the oscillator with which a miniaturization and the outstanding productivity are combined can be offered.

[0100] The metal plate explained above the example which shall have [beforehand / before forming the circuit circuit pattern 8 and an insulator so that the configuration after bending may turn into the configuration of the electromagnetic shielding covering 2 of having the crevice space 30] the shape of a predetermined extensive form.

[0101] The manufacture approach other than the approach explained above is explained below. An insulator is first formed on a metal plate and the circuit circuit pattern 8 and the external connection terminal 10 of a predetermined configuration which consist of a conductor are prepared on an insulator.

[0102] Then, the metal plate which has the circuit circuit pattern 8 is extracted, and it forms by processing as electromagnetic shielding covering 2 which has the shape of a predetermined extensive form.

[0103] Then, if a piezoelectric transducer 4 and the oscillator-circuit components 6 are mounted in the circuit circuit pattern 8 of the electromagnetic shielding covering 2, the electromagnetic shielding covering 2 will become the shape of an extensive form as shown in drawing 3.

[0104] Then, the crevice space 30 which contains a piezoelectric transducer 4 and the oscillator-circuit components 6 is formed by performing bending of the electromagnetic shielding covering 2.

[0105] By this manufacture approach, the electromagnetic shielding covering 2 which has many the circuit circuit patterns 8 and the external connection terminals 10 of a part can be formed in coincidence at the metal plate of one sheet, and it is suitable for mass production method.

[0106] Furthermore, as other manufacture approaches, an insulator is first formed on a metal plate and the circuit circuit pattern 8 and the external connection terminal 10 which have the predetermined configuration which consists of a conductor are formed on this insulator.

[0107] Then, on the circuit circuit pattern 8, a jointing material for corrugated fibreboard is used and a piezoelectric transducer 4 and the oscillator-circuit components 6 are mounted.

[0108] Furthermore, after that, the metal plate which has the circuit circuit pattern 8 which mounted a piezoelectric transducer 4 and the oscillator-circuit components 6 is extracted, and the electromagnetic shielding covering 2 which has the shape of a predetermined extensive form as shown in drawing 3 is formed by processing. Then, the crevice space 30 which contains a piezoelectric transducer 4 and the oscillator-circuit components 6 is formed by performing bending of the electromagnetic shielding covering 2.

[0109] By this manufacture approach, the electromagnetic shielding covering 2 which has many the circuit circuit patterns 8 and the external connection terminals 10 of a part is formed in coincidence at the metal plate of one sheet, and moreover, many the piezoelectric transducer 4 and the oscillator-circuit components 6 of a part can be mounted in coincidence, and it is further suitable for mass production method.

[0110] Furthermore, the manufacture approach different from the example of this invention explained above is explained, referring to drawing 1, drawing 2, and drawing 3.

[0111] First, the circuit circuit pattern 8 and the external connection terminal 10 of a predetermined configuration which consist of a conductor are prepared in the front face of an insulator film (not shown), and a flexible flexible substrate (not shown) is formed.

[0112] This insulator film consists of films which have the thin electric insulation of the thickness which consists of polyimide resin etc.

[0113] The circuit circuit pattern 8 and the external connection terminal 10 make a metal plate with thin thickness, such as copper and aluminum, rival on the front face of an insulator film, and carry out etching processing of this metal plate after that, film formation of the metal membranes, such as copper, aluminum, and silver metallurgy, is carried out with the sputtering method, a vacuum deposition method, etc., or they are prepared in the front face of an insulator film by the approach of printing conductive paste on the front face of an insulator film.

[0114] The configuration of the circuit circuit pattern 8 connects a piezoelectric transducer 4 and the oscillator-circuit components 6 to a position, and as it forms the external connection terminal 10 further, it forms them in a predetermined configuration.

[0115] Furthermore, in order to prevent jointing materials for corrugated fibreboard, such as a pewter and electroconductive glue, flowing out to the exterior of the circuit circuit pattern 8 if needed at the time of the poor insulation by dust etc., and component mounting to the circuit circuit pattern 8, the insulating material (not shown) which consists of resin without conductivity, ceramics, etc. is coated partially. Or using further the thin insulator film of thickness which consists of polyimide resin used for an insulator film, the circuit circuit pattern 8 is put partially, or it prevents that carry out and a jointing material for corrugated fibreboard flows out.

[0116] What has elasticity, respectively is used so that the good thing of adhesion may be mutually used for an insulator film, the circuit circuit pattern 8, and the insulating material for coating the circuit circuit pattern 8 and they may become a flexible flexible substrate.

[0117] the metal plate which consists of iron which has the shape of a predetermined extensive form, brass, etc. next — the insulator film side of a flexible substrate — an adhesion side — carrying out —

thermocompression bonding — or lamination and the electromagnetic shielding covering 2 are formed for both by the pasting-up method.

[0118] Here, each of metal plates and flexible substrates has the adhesive strength and elasticity which can be equal to bending.

[0119] Next, a jointing material for corrugated fibreboard is used for the circuit circuit pattern 8 of the electromagnetic shielding covering 2, and the surface mount of the piezoelectric transducer 4 and the oscillator-circuit components 6 of a surface mount mold is carried out to it.

[0120] A surface mount process forms jointing materials for corrugated fibreboard (not shown), such as a pewter paste and electroconductive glue, in the part which connects mounting components, such as a piezoelectric transducer 4, the oscillator-circuit components 6, etc. of the circuit circuit pattern 8, first.

[0121] Mounting components are arranged using automatic surface mount equipment so that polar zone, such as a predetermined piezoelectric transducer 4, the predetermined oscillator-circuit components 6, etc., may next come to the location in which the jointing material for corrugated fibreboard was prepared.

[0122] And the reflow process and electroconductive glue hardening process which are heat-treatment are performed, and the circuit circuit pattern 8 and the polar zone of mounting components are connected with a jointing material for corrugated fibreboard.

[0123] By these down stream processing, the electromagnetic shielding covering 2 can be formed in a configuration which mounted a piezoelectric transducer 4 and the oscillator-circuit components 6 in the electromagnetic shielding covering 2 of the developed configuration, as shown in drawing 3.

[0124] And the electromagnetic shielding covering 2 which has the shape of a predetermined extensive form as shown in drawing 3 is bent so that a piezoelectric transducer 4 and the oscillator-circuit components 6 may moreover become inside, as a crowning 22 and a flank 24 become almost perpendicular, and the configuration which has the crevice space 30 which contains a piezoelectric transducer 4 and the oscillator-circuit components 6 is formed.

[0125] Before making a piezoelectric transducer 4 and the oscillator-circuit components 6 into the configuration which bends the electromagnetic shielding covering 2 and has the crevice space 30, they are connected to the circuit circuit pattern 8. And when it is made the configuration which bends the electromagnetic shielding covering 2 and has the crevice space 30, a piezoelectric transducer 4 and the oscillator-circuit components 6 are connected to the circuit circuit pattern 8 by the arrangement beforehand taken into consideration so that it may be piled up to high density in the crevice space 30 and may arrange.

[0126] The above explanation showed the example which uses a piezoelectric transducer 4 and the oscillator-circuit components 6 as a surface mount mold. However, as long as it can arrange so that it may be piled up to high density in the crevice space 30 when it is made the configuration which bends the electromagnetic shielding covering 2 and has the crevice space 30, a piezoelectric transducer 4 and the oscillator-circuit components 6 may not be components of a surface mount mold.

[0127] Furthermore, one or more of a piezoelectric transducer 4 and the oscillator-circuit components 6 may be [the remainder] the components of a surface mount mold with components other than a surface mount mold. That is, you may mount in the electromagnetic shielding covering 2 so that surface mount die parts and non-surface mount die parts may be intermingled.

[0128] Although the example which forms the electromagnetic shielding covering 2 which furthermore extracts a metal plate and a flexible substrate and has the shape of a predetermined extensive form by processing was shown, you may form by other processing approaches, such as other shearing works, cutting processing, and etching processing.

[0129] Since it forms with a metallic thin plate with a thickness of 0.1mm – 0.2mm, it is bending-easy and easy to process this electromagnetic shielding covering 2.

[0130] the substrate for mounting which was the need conventionally by this manufacture approach -- it can exclude -- a piezoelectric transducer 4 and the oscillator-circuit components 6 -- automatic-assembling mounting equipment -- mounting -- possible -- in addition -- and it can mount in high

density.

[0131] There is no process which puts the electromagnetic shielding covering 2 on mounting components mounted in the substrate, such as a piezoelectric transducer 4 and the oscillator-circuit components 6, further again. For this reason, the poor assembly the electromagnetic shielding covering 2 and mounting components short-circuit electrically is not caused, but the oscillator with which a miniaturization and the outstanding productivity are combined can be offered.

[0132] Moreover, a flexible substrate can realize multilayering of the circuit circuit pattern 8 easily with a substrate wiring technique.

[0133] This multilayering prepares a metal plate, a metallic foil, or a metal membrane in the front face of the thin insulator film (not shown) of thickness which consists of polyimide etc., and constitutes it as a circuit circuit pattern 8 of the 1st layer.

[0134] Furthermore, the thin insulator film of thickness which consists of polyimide etc. is prepared on this circuit circuit pattern 8 of the 1st layer, a metal plate, a metallic foil, or a metal membrane is further prepared in the front face of that insulator film, and it constitutes as a circuit circuit pattern 8 of the 2nd layer.

[0135] By furthermore forming the circuit circuit pattern 8 of the 3rd layer, the circuit circuit pattern 8 can be formed by multilayer structure in three dimensions, and complicated circuit wiring can be realized.

[0136] Compared with other multilayer substrates, thickness is thin and, moreover, a multilayer flexible substrate has light weight. Therefore, in the oscillator which needs complicated circuit wiring, by using a multilayer flexible substrate, the manufacture approach of this example using a flexible substrate can be small, and, moreover, can offer a light oscillator.

[0137] The metal plate took into consideration beforehand, before making a flexible substrate rival so that the configuration after bending may turn into the configuration of the electromagnetic shielding covering 2 of having the crevice space 30, and it showed the example which shall have the shape of a predetermined extensive form.

[0138] As the manufacture approach other than the manufacture approach explained above, on an insulator film, the circuit circuit pattern 8 and the external connection terminal 10 of a predetermined configuration which consist of a conductor are prepared, and a flexible substrate is formed.

[0139] Then, this metal plate and flexible substrate that were made to rival are extracted for a flexible substrate lamination and after that to a metal plate, and the electromagnetic shielding covering 2 which has the shape of a predetermined extensive form is formed by processing.

[0140] Then, if a jointing material for corrugated fibreboard is used for the circuit circuit pattern 8 of the electromagnetic shielding covering 2 and a piezoelectric transducer 4 and the oscillator-circuit components 6 are mounted in it, the electromagnetic shielding covering 2 can be formed in the shape of [as shown in drawing 3] an extensive form.

[0141] Then, the crevice space 30 which contains a piezoelectric transducer 4 and the oscillator-circuit components 6 can be formed by performing bending of the electromagnetic shielding covering 2.

[0142] In this manufacture approach, simultaneous, it is the same configuration and the metal plate of the electromagnetic shielding covering 2 which has the shape of a predetermined extensive form, and the configuration of a flexible substrate can be formed easily.

[0143] Therefore, it is advantageous to make the configurations of the metal plate of the electromagnetic shielding covering 2, and a flexible substrate into the same configuration.

[0144] As the another manufacture approach, on an insulator film, the circuit circuit pattern 8 and the external connection terminal 10 of a predetermined configuration which consist of a conductor are prepared, and it forms as a flexible substrate further again.

[0145] Then, a flexible substrate is made to rival in a metal plate. Furthermore, after that, a jointing material for corrugated fibreboard is used for the circuit circuit pattern 8 of a flexible substrate, and a piezoelectric transducer 4 and the oscillator-circuit components 6 are mounted in it.

[0146] Then, the electromagnetic shielding covering 2 which has the shape of an extensive form of the

predetermined configuration shown in drawing 3 can be formed by [of the flexible substrate which mounted a piezoelectric transducer 4 and the oscillator-circuit components 6, and the metal plate made to rival] processing it by extracting.

[0147] Then, the electromagnetic shielding covering 2 which has the crevice space 30 which contains a piezoelectric transducer 4 and the oscillator-circuit components 6 can be formed by performing bending of the electromagnetic shielding covering 2.

[0148] By this manufacture approach, the configurations of the metal plate of the electromagnetic shielding covering 2 and a flexible substrate of having the shape of a predetermined extensive form can be easily formed in the same configuration simultaneous.

[0149] This manufacture approach is advantageous to make the configuration of the metal plate of the electromagnetic shielding covering 2, and a flexible substrate into the same configuration.

[0150] Moreover, the circuit circuit pattern 8 and the external connection terminal 10 of a part are prepared in coincidence at one flexible substrate, further after that, many the piezoelectric transducer 4 and the oscillator-circuit components 6 of a part can be mounted in coincidence, and a large number are suitable for mass production method.

[0151] Furthermore, as the another manufacture approach, on an insulator film, the circuit circuit pattern 8 and the external connection terminal 10 of a predetermined configuration which consist of a conductor are prepared, and it forms as a flexible substrate.

[0152] Then, a jointing material for corrugated fibreboard is used for the circuit circuit pattern 8 of a flexible substrate, and a piezoelectric transducer 4 and the oscillator-circuit components 6 are mounted in it.

[0153] Then, the flexible substrate which has mounted a piezoelectric transducer 4 and the oscillator-circuit components 6 in the metal plate of the shape of a predetermined extensive form is made to rival, and the electromagnetic shielding covering 2 as shown at drawing 3 is formed.

[0154] Then, the electromagnetic shielding covering 2 which has the crevice space 30 which contains a piezoelectric transducer 4 and the oscillator-circuit components 6 can be formed by performing bending of the electromagnetic shielding covering 2.

[0155] By this manufacture approach, the circuit circuit pattern 8 and the external connection terminal 10 of a part are prepared in coincidence at one flexible substrate, further after that, many the piezoelectric transducer 4 and the oscillator-circuit components 6 of a part can be mounted in coincidence, and a large number are suitable for mass production method.

[0156] Furthermore, as the another manufacture approach, on an insulator film, the circuit circuit pattern 8 and the external connection terminal 10 of a predetermined configuration which consist of a conductor are prepared, and it forms as a flexible substrate.

[0157] Then, a jointing material for corrugated fibreboard is used for the circuit circuit pattern 8 of a flexible substrate, and a piezoelectric transducer 4 and the oscillator-circuit components 6 are mounted in it.

[0158] Then, the flexible substrate which mounts a piezoelectric transducer 4 and the oscillator-circuit components 6 is made to rival in a metal plate.

[0159] Then, the electromagnetic shielding covering 2 which has the shape of a predetermined extensive form as shown in drawing 3 can be formed by [of the flexible substrate which mounted a piezoelectric transducer 4 and the oscillator-circuit components 6, and the metal plate which made this flexible substrate rival] processing it by extracting.

[0160] Then, the electromagnetic shielding covering 2 which has the crevice space 30 which contains a piezoelectric transducer 4 and the oscillator-circuit components 6 can be formed by performing bending of the electromagnetic shielding covering 2.

[0161] In this manufacture approach, it is the same simultaneous and configuration and the configuration of the metal plate of the electromagnetic shielding covering 2 which has the shape of a predetermined extensive form, and a flexible substrate can be formed easily.

[0162] This is advantageous to make the configuration of the metal plate of the electromagnetic shielding covering 2, and a flexible substrate into the same configuration.

[0163] Moreover, the circuit circuit pattern 8 and the external connection terminal 10 of a part are prepared in coincidence at one flexible substrate, further after that, many the piezoelectric transducer 4 and the oscillator-circuit components 6 of a part can be mounted in coincidence, and a large number are suitable for mass production method.

[0164] Furthermore, the surface part 26 corresponding to the exterior is shown in drawing 1, drawing 2, and drawing 3. It bent and this surface part 26 corresponding to the exterior formed the flank 24 of the electromagnetic shielding covering 2 which has the external connection terminal 10 so that it might become almost parallel to a crowning 22, and it is near the pars basilaris ossis occipitalis of an oscillator, and it provides it so that the external connection terminal 10 may touch almost in parallel to the external connection side 62 of an external circuit.

[0165] The structure and its formation approach of this surface part 26 corresponding to the exterior form the surface part 26 corresponding to the dead exterior for bending at the same process which forms that crevice space 30, when making it into the configuration which prepares the surface part 26 corresponding to the exterior beforehand, bends the electromagnetic-shielding covering 2, and has the crevice space 30 the shape of an extensive form of the electromagnetic-shielding covering 2 of a flat-surface configuration, as it is adapted also in which example of the oscillator of this invention and is shown in drawing 3.

[0166] By forming the surface part 26 corresponding to the exterior of this structure, the connection resilience of the external connection terminal 10 and the external connection side 62 of an external circuit becomes high, and the oscillator which can perform connection immobilization certainly can be offered.

[0167] By the explanation so far, before forming the electromagnetic shielding covering 2 which has the crevice space 30 which contains a piezoelectric transducer 4 and the oscillator-circuit components 6 by bending, the example which connects a piezoelectric transducer 4 and the oscillator-circuit components 6 to the circuit circuit pattern 8 was shown.

[0168] The oscillator in other examples of this invention is shown in drawing 4 and drawing 5. Drawing 4 is a perspective view which cuts and lacks some electromagnetic shielding coverings of an oscillator, and is shown from a rear face, and drawing 5 is the sectional view showing the cross section in the B-B line of drawing 4. With reference to drawing 4 and drawing 5 by turns, it explains below.

[0169] The circuit circuit pattern 8 is formed in flank inside 24a of the electromagnetic shielding covering 2 equipped with the crevice space 30, and top inside 22a, respectively.

[0170] And some oscillator-circuit components 6 carry out connection immobilization using the jointing material for corrugated fibreboard which becomes the circuit circuit pattern 8 of top inside 22a from a pewter or electroconductive glue.

[0171] Furthermore, remaining oscillator-circuit components 6 and piezoelectric transducers 4 use a jointing material for corrugated fibreboard for the circuit circuit pattern 8 of flank inside 24a, and carry out connection immobilization.

[0172] A piezoelectric transducer 4 carries out connection immobilization using the jointing material for corrugated fibreboard which becomes the circuit circuit pattern 8 of side-face inside 24a of the pair-which faces each other in parallel from a pewter or electroconductive glue so that the top face of the oscillator-circuit components 6 which carry out connection immobilization may be straddled to the circuit circuit pattern 8 of top inside 22a.

[0173] The manufacture approach of the structure shown in this drawing 4 and drawing 5 carries out the surface mount of the oscillator-circuit components 6 to top inside 22a of the electromagnetic shielding covering 2 and flank inside 24a which have the shape of a predetermined extensive form as shown in drawing 3 first.

[0174] Then, bending of the electromagnetic shielding covering 2 is performed and the electromagnetic

shielding covering 2 is formed in a configuration with the crevice space 30.

[0175] Then, connection immobilization is carried out using the jointing material for corrugated fibreboard which becomes the circuit circuit pattern 8 of flank inside 22a of the pair which faces each other in parallel from a pewter, electroconductive glue, etc. so that it may put and the clearance between the crevice space 30 may be filled so that the top face of some oscillator-circuit components 6 which mount only the piezoelectric transducer 4 in top inside 22a may be straddled.

[0176] Piezoelectric transducers 4 are the components of the largest configuration in the components carried in an oscillator. Therefore, a piezoelectric transducer 4 does not carry out connection immobilization at the circuit circuit pattern 8 of top inside 22a, but as it straddles the top face of the oscillator-circuit components 6, it carries out connection immobilization at the circuit circuit pattern 8 of side-face inside 24a of the pair which faces each other in parallel. An area of base can be made small and the clearance between the crevice space 30 can be fill uped with the structure shown in this drawing 4 and drawing 5 to high density.

[0177] Moreover, with this structure, a piezoelectric transducer 4 cannot carry out a surface mount to the oscillator-circuit components 6 and coincidence. However, a piezoelectric transducer 4 is arranged near opening of the electromagnetic shielding covering 2 of the location which are the components of the largest configuration as mentioned above in the components carried in an oscillator, and is the easiest to mount.

[0178] For this reason, the pewter trowel point tends to enter in the crevice space 30, and assembly-operation nature is good. being small by making it this structure. — in addition, an oscillator with a still smaller area of base can be offered.

[0179] In the example explained using the above drawing 4 and drawing 5, before forming in the configuration which had the crevice space 30 by the thing of the electromagnetic shielding covering 2 to do for bending; after forming in the configuration which mounted the oscillator-circuit components 6 altogether; performed bending, and had the crevice space 30, the example which mounts only a piezoelectric transducer 4 in the circuit circuit pattern 8 was shown.

[0180] However, when a piezoelectric transducer 4 and the oscillator-circuit components 6 are altogether mounted in the crevice space 30 of the electromagnetic shielding covering 2 If it can arrange so that it may be piled up to high density in the crevice space 30, after mounting at least one of a piezoelectric transducer 4 and the oscillator-circuit components 6 in the circuit circuit pattern 8, by performing bending The electromagnetic shielding covering 2 which has the crevice space 30 which contains the oscillator-circuit components 6 with piezo-electric oscillating 4 child may be formed, and at least one of a piezoelectric transducer 4 and the oscillator-circuit components 6 may be mounted in the circuit circuit pattern 8 after that.

[0181] The oscillator in example still more nearly another next is explained. The oscillator in other examples of this invention is shown in the perspective view of drawing 6. Drawing 7 is the sectional view showing the cross section in the C-C line of drawing 6. With reference to drawing 6 and drawing 7 by turns, it explains below.

[0182] The example explained using this drawing 6 and drawing 7 is related with the structure of the external connection terminal 10. The circuit circuit pattern 8 and the external connection terminal 10 put the both sides with the film 46 which consists of an insulator partially, and constitute the flexible substrate 42.

[0183] The electromagnetic shielding covering 2 is formed in a metal plate 48 for the flexible substrate 42 with lamination, and this metal plate 48 and flexible substrate 42.

[0184] And the electromagnetic shielding covering 2 which has the crevice space 30 which contains a piezoelectric transducer 4 and the oscillator-circuit components 6 can be formed by performing bending of the electromagnetic shielding covering 2.

[0185] The external connection terminal 10 is connected with the external connection side 62 of an external circuit with a pewter or electroconductive glue. For this reason, the edge of the flexible

substrate 42 is prepared near the base of the flank 24 of the electromagnetic shielding covering 2 which has the crevice space 30.

[0186] And the roll off 28 which cut and lacked the flank 24 of the electromagnetic shielding covering 2 is formed so that the external connection terminal 10 may be exposed on the outside of the crevice space 30.

[0187] This roll off 28 is formed so that the external connection terminal 10 and the external connection side 62 of an external circuit may become a connectable magnitude dimension with a pewter or electroconductive glue.

[0188] being small by making it the structure which the external connection terminal 10 exposes from this roll off 28 — in addition, when connecting the external connection terminal 10 and the external connection side 62 of an external circuit, the oscillator which can check the connection condition of jointing materials for corrugated fibreboard, such as a pewter and electroconductive glue, visually can be offered.

[0189] If the pewter of a jointing material for corrugated fibreboard etc. flows into the outside of the external connection terminal 10 and the electromagnetic shielding covering 2 is contacted when connecting to the external connection side 62 of an external circuit the external connection terminal 10 exposed by roll off 28, the external connection terminal 10 and the electromagnetic shielding covering 2 will short-circuit electrically, and will pose a problem.

[0190] Then, in order to prevent that jointing materials for corrugated fibreboard, such as a pewter and electroconductive glue, flow out preferably, it is good to form the solder resist section 44 between the external connection terminal 10 exposed by roll off 28, and the metal plate 48 with the electromagnetic shielding covering 2.

[0191] A part may be constituted using a field or this solder resist section 44 may coat the flexible substrate 42 with insulating materials, such as resin without the conductivity of epoxy system resin etc. of the film 46 which consists of an insulator which has put the circuit circuit pattern 8, and ceramics.

[0192] In drawing 7, the solder resist section 44 shows the example constituted using some films 46 of an insulator.

[0193] being small by making it this structure — in addition, when connecting the external connection terminal 10 and the external connection side 62 of an external circuit, the oscillator which can check the connection condition of jointing materials for corrugated fibreboard, such as a pewter and electroconductive glue, visually can be offered.

[0194] Furthermore, the oscillator which can perform connection immobilization easily can be offered, without the external connection terminal 10 and the electromagnetic shielding covering 2 short-circuiting electrically.

[0195] Moreover, it is near the base of the flank 24 of the electromagnetic shielding covering 2 which has the crevice space 30, and prepares in the surface part 26 corresponding to the exterior which explained the external connection terminal 10 moreover prepared near the edge of the flexible substrate 42 using drawing 1.

[0196] And the roll off 28 which cut and lacked the flank 24 of the electromagnetic shielding covering 2 is formed so that the external connection terminal 10 prepared in the surface part 26 corresponding to the exterior may be exposed on the outside of the crevice space 30.

[0197] When connecting the external connection terminal 10 and the external connection side 62 of an external circuit in addition to being small by making it this structure, the connection condition of jointing materials for corrugated fibreboard, such as a pewter and electroconductive glue, can be checked visually.

[0198] The connection resilience of the external connection terminal 10 and the external connection side 62 of an external circuit is high, and the oscillator which can moreover ensure connection immobilization can be offered further again.

[0199] Moreover, it prepares in the surface part 26 corresponding to the exterior which explained the

external connection terminal 10 which is near the base of the flank 24 of the electromagnetic shielding covering 2 which has the crevice space 30, and was prepared near the edge of the flexible substrate 42 using drawing 1.

[0200] And the roll off 28 which cut and lacked the flank 24 of the electromagnetic shielding covering 2 is formed so that the external connection terminal 10 prepared in the surface part 26 corresponding to the exterior may be exposed on the outside of the crevice space 30.

[0201] Furthermore, it prepared in the surface part 26 corresponding to the exterior, and the solder resist section 44 is formed between the metal plates 48 of the external connection terminal 10 and the electromagnetic shielding covering 2 which are exposed in the field of roll off 28.

[0202] When connecting the external connection terminal 10 and the external connection side 62 of an external circuit in addition to being small by making it this structure, the connection condition of jointing materials for corrugated fibreboard, such as a pewter and electroconductive glue, can be checked visually.

[0203] Furthermore, the connection resilience of the external connection terminal 10 and the external connection side 62 of an external circuit is high, and, moreover, can carry out connection immobilization of both certainly.

[0204] Furthermore, the external connection terminal 10 and the electromagnetic shielding covering 2 can offer the oscillator which can ** carrying out connection immobilization easily, without short-circuiting electrically.

[0205] The oscillator in other examples is explained below. The oscillator in other examples of this invention is shown in the perspective view of drawing 8. In this example, a bending process is further carried out to the structure of having the external connection terminal 10 and the surface part 26 corresponding to the exterior which were explained using drawing 1, and amelioration is added to it.

[0206] the surface part 26 corresponding to the exterior where the structure of the oscillator explained using drawing 8 was equipped with the external connection terminal 10 — an outside — bending — some external connection terminals 10 — it constitutes so that a field may be exposed on the outside of an oscillator.

[0207] By making it this structure, the connection resilience of the external connection terminal 10 and the external connection side 62 of an external circuit is high, and, moreover, can carry out connection immobilization of both certainly.

[0208] Furthermore, when an external circuit and the external external connection terminal 10 are connected, the connection condition of jointing materials for corrugated fibreboard, such as a pewter and electroconductive glue, can be checked visually easily, and the oscillator which a characteristic inspection moreover tends to carry out can be offered.

[0209] Shock resistance, moisture resistance, etc. are required as a dependability property of an oscillator. In the oscillator-circuit components 6, components, such as a capacitor from which an electrical property changes, are contained by humidity, and when high moisture resistance is required, the problem arises in the stability of an oscillator circuit frequently.

[0210] Then, in the oscillator of this invention, when high shock resistance is required, when high moisture resistance is required, after mounting some or all of a piezoelectric transducer 4 and the oscillator-circuit components 6 in high-density, circuit encapsulant is poured into the crevice space 30, and a piezoelectric transducer 4 and the oscillator-circuit components 6 are closed to the crevice space 30 inside the electromagnetic shielding covering 2.

[0211] In addition, this closure processing may go to some oscillator-circuit components 6, such as a capacitor with bad moisture resistance.

[0212] As circuit encapsulant, circuit encapsulants, such as epoxy system resin and silicone system resin, are used. And it is liquid, and slushes into the crevice space 30, and this circuit encapsulant is usually solidified by [with viscosity] adding heat-treatment and UV irradiation.

[0213] Moreover, the circuit encapsulant of the type hardened by pouring in a curing agent may be used

for circuit encapsulant:

[0214] When pouring circuit encapsulant into the crevice space 30, sealing agents, such as silicone system resin, close the clearance between the flank 24 of the electromagnetic shielding covering 2, and this flank 24, or welding processing and caulking close a flank 24 and this flank 24, and it prevents circuit encapsulant flowing into the outside of the crevice space 30.

[0215] In addition, if circuit encapsulant does not flow into the outside of the crevice space 30, sealing agents, such as silicone system resin, do not have to close the clearance between the flank 24 of the electromagnetic shielding covering 2, and this flank 24, neither welding processing nor caulking haves to close a flank 24 and a flank 24, or it is not necessary to carry out.

[0216] thus, the effect of humidity to the oscillator-circuit components 6 from which a property changes with humidity while preventing invasion of dust etc. by pouring circuit encapsulant into the crevice space 30, and closing a piezoelectric transducer 4 and the oscillator-circuit components 6 — removing — in addition — and it becomes possible to raise the rigidity and shock resistance of an oscillator.

[0217] Moreover, in the conventional oscillator, when carrying out the circuit closure for components in this way with a to some extent large height dimension in small area, it is required to make the crevice space which prepares a circuit closure frame and slushes circuit encapsulant so that this component may be surrounded on a substrate, or to carry out the resin mold of the passive circuit elements using metal mold.

[0218] Preparing this circuit closure frame will lead to the increment in substrate area, and an oscillator configuration will be enlarged.

[0219] Furthermore, a manufacturing installation will become large-scale when carrying out the resin mold of the passive circuit elements using metal mold.

[0220] On the other hand, in the oscillator of this invention, a circuit closure frame is constituted from the crowning 22 and flank 24 of the electromagnetic shielding covering 2, circuit encapsulant is poured in, and it is made the structure which closes a piezoelectric transducer 4 and the oscillator-circuit components 6. The oscillator in which dependability, such as shock resistance and moisture resistance, was excellent with this in addition to the small thing can be offered easily.

[0221] Recently, oscillators, such as a digital temperature compensation oscillator which carried the digital semiconductor integrated circuit equipped with memory as semiconductor integrated circuit components of the oscillator-circuit components 6, are developed.

[0222] These oscillators needed to write data in the digital semiconductor integrated circuit, or needed to read data for the test, and are equipped with many external connection terminals 10.

[0223] Moreover, in order to equip a small field with many external connection terminals 10 in the case of a small oscillator, the pitch dimension of the external connection terminal 10 becomes fine.

[0224] What is necessary is just to adopt the means of a publication as below, when many external connection terminals 10 are demanded with the oscillator of this invention. As first shown in drawing 1, the flank 24 of the electromagnetic shielding covering 2 which has the external connection terminal 10 is bent so that it may become almost parallel to a crowning 22, and the surface part 26 corresponding to the exterior which has the external connection terminal 10 is formed.

[0225] And connection with the external connection terminal 10 of a surface part 26 and the external connection side 62 of an external circuit corresponding to the exterior is made using anisotropy electroconductive glue.

[0226] when carrying out field junction of the terminal electrodes which have a certain pitch dimension on a substrate, this anisotropy electroconductive glue is put between the terminal electrodes of these substrates, is heated, and pressurized and stiffened, and is joined — it is.

[0227] And conductivity is not shown in the ***** direction of the terminal electrode of a substrate, but conductivity is shown only in the direction put with the conductor of the pressurization direction. Especially, connection with electroconductive glue or a pewter is effective in connection of the difficult terminal electrode of a fine pitch dimension.

[0228] As anisotropy electroconductive glue, the thing which made electric insulation resin distribute an electric conduction filler is known, and it is liquefied with viscosity before hardening. The connection between the external connection terminal 10 and the external connection side 62 of an external circuit is easily connectable by using this anisotropy electroconductive glue.

[0229] For this reason, it is realizable connection of the external connection terminal 10 which has many numbers of terminals and has a detailed pitch dimension in a small field.

[0230] being small by making it the structure using this anisotropy electroconductive glue — in addition, the oscillator which can connect many external connection terminals 10 to the external connection side 62 of an external circuit easily in a small field can be offered.

[0231] The above explanation showed the example which uses anisotropy electroconductive glue for connection between the external connection terminal 10 and the external connection side 62 of an external circuit. However, an anisotropy conductivity film may be used instead of anisotropy electroconductive glue.

[0232] This anisotropy conductivity film is the thing of the shape of a sheet which has the resiliency which distributed the electric conduction filler in the resin which has electric insulation, and shows conductivity only in the pressurization direction like anisotropy electroconductive glue.

[0233] And an anisotropy conductivity film does not have adhesive strength. For this reason, while pressurizing the external connection terminal 10 and the external connection side 62 of an external circuit, components, such as a connector which carries out positioning immobilization, are required.

[0234] what carried out wirebonding of the bare chip semiconductor integrated circuit although the configuration where it packed on the rectangular parallelepiped or the cube mostly illustrated the oscillator-circuit components 6, such as a semiconductor integrated circuit, in the example of this invention, and the hill which carried out flip chip mounting and which carried out mold — the oscillator-circuit components 6 of the thing of a configuration and other configurations may be carried.

[0235] Furthermore by explanation of a more than in the example of this invention, the example which has the crowning 22 which is a rectangle mostly and is a flat-surface configuration, has the flank 24 which has the same height in the perimeter of the periphery section of a crowning 22 mostly covering a right angle from the periphery section of the crowning 22, and has the crevice space 30 surrounded by the crowning 22 and the flank 24 explained the configuration of the electromagnetic shielding covering 2.

[0236] However, as long as mounting of the tooth space and piezoelectric transducer 4 which contain an oscillator, or the oscillator-circuit components 6 is possible, a polygon, a round shape, and an ellipse form are sufficient as the configuration of a crowning 22. furthermore, a crowning 22 and a flank 24 — a hollow and a projection — also preparing — it is good.

[0237] Furthermore, if it is extent which does not have effect in the effectiveness of electromagnetic shielding, and mounting of a piezoelectric transducer 4 or the oscillator-circuit components 6, a flank 24 does not need to have the same height dimension over the perimeter. furthermore, a crowning 22 and a flank 24 — notching, a through hole, and a non-through hole — also preparing — it is good.

[0238] Thus, by forming a hollow, a projection, notching, a through hole, a non-through hole, etc. in a crowning 22 or a flank 24, it has the effectiveness that positioning in an assembly process becomes easy, and an oscillator is adjoined and also there is effectiveness of being able to prevent interference with components further again.

[0239]

[Effect of the Invention] By the above explanation, the oscillator of this invention is arranged so that a piezoelectric transducer and oscillator-circuit components may be piled up in crevice space to the circuit circuit pattern of the top inside of electromagnetic shielding covering and flank inside which have crevice space, so that clearly.

[0240] By this, conventionally, the space which was intact as for crevice space can be decreased, and it is easy structure, it becomes possible to also make an area of base small with content volume, and the miniaturization of an oscillator can be attained.

[0241] Furthermore, when electromagnetic shielding covering equipped with the circuit circuit pattern and external connection terminal of a predetermined configuration has the shape of a monotonous extensive form, the crevice space which contains a piezoelectric transducer and oscillator-circuit components is formed by mounting a piezoelectric transducer and oscillator-circuit components in the circuit circuit pattern of the top inside in electromagnetic shielding, and a flank inside, and performing bending of electromagnetic shielding covering after that.

[0242] By this, a piezoelectric transducer and oscillator-circuit components can be arranged so that it may be piled up to high density in crevice space, and the miniaturization of an oscillator and improvement in productivity can be attained.

[0243] Furthermore, after mounting oscillator-circuit components and a piezoelectric transducer in a circuit circuit pattern like before, it is not necessary to put electromagnetic shielding covering. For this reason, a miniaturization and the outstanding productivity can both be attained, without electromagnetic shielding covering, and oscillator-circuit components and a piezoelectric transducer short-circuiting electrically.

[0244] furthermore, being small by adopting the structure prepare the external connection terminal linked to an external circuit in the surface part corresponding to the exterior, or adopting the structure make connection with an external circuit using anisotropy electroconductive glue or an anisotropy electric conduction film — in addition, many external connection terminals can be carried out in little area, and, moreover, connection immobilization of both can be easily carried out certainly with high connection resilience in an external circuit.

[0245] Furthermore, circuit encapsulant is poured into the crevice space of electromagnetic shielding covering, and, in addition to a small thing, the oscillator excellent in dependability, such as shock resistance and moisture resistance, can be offered by making it the structure which closes a piezoelectric transducer and oscillator-circuit components.

[Translation done.]

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 - 2.**** shows the word which can not be translated.
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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the perspective view showing the oscillator in the 1st example of this invention from a rear face.

[Drawing 2] It is the sectional view showing the oscillator in the 1st example of this invention.

[Drawing 3] It is the top view showing signs that the oscillator in the 1st example of this invention developed.

[Drawing 4] It is the perspective view showing the oscillator in other examples of this invention from a rear face.

[Drawing 5] It is the sectional view showing the oscillator in other examples of this invention.

[Drawing 6] It is the perspective view showing the oscillator in other examples of this invention from a

'rear face.'

[Drawing 7] It is the sectional view showing the oscillator in other examples of this invention.

[Drawing 8] It is the perspective view showing the oscillator in other examples of this invention from a top face.

[Drawing 9] It is the perspective view showing the oscillator in the conventional example from a top face.

[Drawing 10] It is the sectional view showing the oscillator in the conventional example.

[Drawing 11] It is the perspective view showing the oscillator in the conventional example from a top face.

[Drawing 12] It is the perspective view showing the oscillator in the conventional example from a top face.

[Description of Notations]

2 Electromagnetic Shielding Covering

4 Piezoelectric Transducer

6 Oscillator-Circuit Components

8 Circuit Circuit Pattern

10 External Connection Terminal

28 Roll Off

30 Crevice Space

42 Flexible Substrate

[Translation done.]